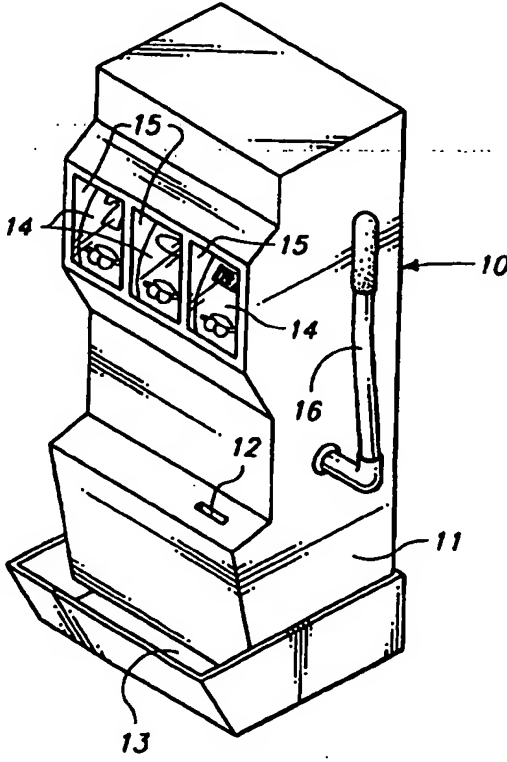


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<b>(21) International Application Number:</b> PCT/US96/02157 <b>(22) International Filing Date:</b> 20 February 1996 (20.02.96) <b>(71) Applicant (for all designated States except US):</b> CASINOVA-TIONS, INC. [US/US]; Suite 107, 2718 E. 57th, Spokane, WA 99223 (US). <b>(72) Inventors; and</b> <b>(73) Inventors/Applicants (for US only):</b> SINES, Randy, D. [US/US]; 4056 S. Madelia, Spokane, WA 99203 (US). FORTE, Steven, L. [US/US]; 315 Francisco Street, Henderson, NV 89014 (US). <b>(74) Agents:</b> GREGORY, Randy, A. et al.; Suite 1300, 601 West First Avenue, Spokane, WA 99204-0317 (US).		<b>(81) Designated States:</b> AL, AM, AT, AT (Utility model), AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, FI (Utility model), GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> SLOT MACHINE AND METHODS OF OPERATION  <b>(57) Abstract</b> <p>A slot machine (10) is modified to identify subsets of related symbols in a randomly selected set of symbols. The symbols within the subset can then be directed to wheels (14, 30, 51) or other visually movable displays (55) in an order such that related symbols will appear first to a player. A deciding symbol will be indexed on the last wheel to reach a stationary position. Slowing of the speed at which symbols are displayed to a player on the final wheel to be indexed further adds to the anticipation and suspense of playing the enhanced games. Additional enhancement of play on the slot machine can be achieved by optically extending the viewed area of one or more rotating wheels (14, 30, 51).</p> 		

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PN - DE19614114 A1 19971016  
 AP - DE19961014114 19960410  
 PA - ADP GAUSELMANN GMBH [DE]  
 PR - DE19961014114 19960410  
 TI - Coin operated amusement machine  
 AB - The machine has counters with associated displays. It has a symbol play device with symbol bearing rotating bodies. When these are still, a symbol combination is shown through viewing windows. A win or lose condition is associated with each symbol combination. The device has a panel with transparent light-up display fields (14) with win values, which form a monotonous sequence. When at least two special symbols and a further win symbol are shown in the windows (9,10,13) the associated win value is shown by illuminating the associated display fields in the panel (15,16). To display a further special symbol in the window a win value associated with the symbol shown in the window (13) is illuminated and added to a prize counter.  
 IC - G07F17/34  
 ICAI - G07F17/32  
 ICCI - G07F17/32  
 EC - G07F17/32A

G07F17/32A

AN - 1997-504497 [47]  
 TI - Coin operated amusement machine - provides associated win value to symbol combination according to prize plan  
 AB - DE19614114 The machine has counters with associated displays. It has a symbol play device with symbol bearing rotating bodies. When these are still, a symbol combination is shown through viewing windows. A win or lose condition is associated with each symbol combination. The device has a panel with transparent light-up display fields (14) with win values, which form a monotonous sequence.  
 - When at least two special symbols and a further win symbol are shown in the windows (9,10,13) the associated win value is shown by illuminating the associated display fields in the panel (15,16). To display a further special symbol in the window a win value associated with the symbol shown in the window (13) is illuminated and added to a prize counter.  
 - ADVANTAGE - Provides increased play variety and interest.(Dwg.1/1)  
 IW - COIN OPERATE AMUSE MACHINE ASSOCIATE WINNING VALUE SYMBOL COMBINATION ACCORD PRIZE PLAN  
 PN - DE19614114 A1 19971016 DW199747 G07F17/34 004pp  
 IC - G07F17/34  
 MC - T01-J05A T05-H05E  
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## **DESCRIPTION**

### **SLOT MACHINE AND METHODS OF OPERATION**

#### **Technical Field**

The field of this invention is slot machines and methods for enhancing  
5 their operation.

#### **Background Art**

The gaming industry has in recent years undergone a significant expansion. Many different types of card games, keno, lotteries, roulette, and other forms of gaming have drawn attention during this expansion. Substantial efforts have been  
10 made to add variety to such games to enhance the attractiveness of the games for the players. Despite this increased variety, the most popular form of gaming continues to be centered about slot machines. They account for approximately three-fourths of the total volume of all gambling activities in the United States and their popularity seems to be increasing.

15 Because of the volume of slot machine gaming, numerous devices, rules and methods of have been proposed and introduced in efforts to improve the games. Video slot machines have been introduced and were initially well received, but have not replaced the mechanical displays associated with the "one arm bandits." Push button operation has also come and passed through  
20 popularity. Despite many such noticeable improvements or changes, many people still prefer the more traditional mechanical slot machines. The action and sounds of mechanical reel slot machines have a particular and very widespread appeal to a large number of gamblers seeking this form of entertainment.

Despite numerous improvements made over the years since 1892, when  
25 machines that paid off in coins were introduced, there remains a need for improved slot machines and methods which provide more attractive slot machine play and associated entertainment.

#### **Brief Description of the Drawings**

Preferred embodiments of the invention are described below with reference  
30 to the accompanying drawings, which are briefly described below.

Fig. 1 is a simplified perspective view of a typical slot machine;

Fig. 2 is a schematic diagram of a control system;

Fig. 3 is a front elevation view of a first embodiment of the invention;

Fig. 4 is a diagrammatic view of the window improvements shown in  
35 Fig. 3;

Fig. 5 is a front elevation view of a second embodiment;

Fig. 6 is a front elevation view of a third embodiment; and

Fig. 7 is a front elevation view of a fourth embodiment.

Fig. 8 is a schematic presentation of optical components which may be used in a further form of the invention.

5 **Best Modes for Carrying Out the Invention and Disclosure of Invention**

A conventional slot machine 10 is generally illustrated in Fig. 1. A housing 11 encloses its mechanical and/or electronic components. A coin slot 12 is provided to receive one or more coins as the machine is being activated by a player. Coins paid out as a result of machine operation are discharged by  
10 the slot machine 10 into a trough 13.

Most slot machines include a plurality of upright cylindrical reels 14 having visual symbols arranged in a series about a transverse rotational axis. A randomly determined set of symbols are displayed to a player at the completion of each operational sequence initiated by the player. The individual reels are  
15 angularly indexable to stop the reels and present a stationary set of symbols which are positioned at selected angular positions about their respective relational axes. The indexed reels are presented for viewing purposes through transparent windows 15.

Each operational sequence of slot machine 10 is started by pulling upon  
20 a handle 16 or otherwise activating play of the machine. Button activation controls can also be used in such machines, but the action of physically pulling a handle 16, the sounds of the reels 14 as they are indexed and fall into line, and the expected jangle of cascading coins dropping into the trough 13 all form part of the mystique or attraction attributed to slot machines in general.

25 In most modern slot machines, the reels 14 are indexed or stopped at randomly selected angular positions under control of electronic circuits and microprocessors. The microprocessors often function as random number generators which randomly select a set of symbols to be assigned to the reels as they are indexed or stopped. The microprocessors also determine the amount  
30 of each payout, if any, according to preset combinations of the visual symbols displayed on the reels. Although the random selection of these symbols forms no part of the present invention, an exemplary description of the implementation of this feature can be found in U.S. Patent No. 4,095,795, hereby incorporated by reference.

35 A generalized diagram of the control features for a modern slot machine is provided in Fig. 2.

A conventional coin input 17 is provided to send a signal to processor 18 when one or more coins have been inserted through coin slot 12. Upon closing a player-operated switch by use of handle 16 or a button, the processor 18 randomly selects a set of symbols to be assigned to the machine reels 14. The  
5 processor also calls for the reels 14 to be spun or otherwise initiates visual operation of the slot machine 10, such as by controlling a suitable display to effect the visual equivalent of or an alternative visual prelude functioning similar to mechanical spinning of the reels.

Processor 18 then angularly indexes reels 14 as their rotation is stopped  
10 to display the randomly selected set of symbols. This is achieved through operation of a conventional electro-mechanical controller 20. While initiation of the rotation of the individual reels 14 takes place simultaneously, they are normally indexed in a timed sequence which typically precedes from one side of the machine to its remaining side. If the selected set of symbols on the  
15 indexed reels 14 results in a monetary payout, processor 18 sends a signal to a coin payout mechanism 21, which then dispenses the coins to trough 13 or increments a credit display (not shown).

As used herein, the term "visually movable display" shall include any form of display incorporated within a slot machine for presenting a series of symbols  
20 that can be positionally indexed as a display for selected set of symbols to a player at the completion of an operational game sequence that has been initiated by the player. A visually movable display can be either a physical symbol-bearing member, such as a wheel, cylinder or disk, or can be any form of symbol readout or display device which can be cycled through a sequence of  
25 different symbols by electronic means. This definition specifically includes both rotatable reels having symbols displayed about their circumferential peripheries, and rotatable disks or annular wheels or reels having symbols on display faces transverse to their axes. "Symbols" can be alpha-numeric, graphic or blank.

Additional forms of displays contemplated for use in some forms of this  
30 invention further include liquid crystal displays, flat panel semiconductor display screens, polarized screen displays, or more preferably stereoscopic optical projection displays utilizing a holographic screen which can simulate a three-dimensional image for viewing by the slot machine user. Although such electronically controlled displays are contemplated, it should still further be  
35 appreciated that many slot machine players still prefer the action of more traditional mechanical wheels or other reels, and that at this time the invention

is considered most applicable to mechanical reel slot machines and such are the most preferred version of carrying out at least some of the forms and methods of this invention.

This disclosure is applicable to any conventional form of controller 20.  
5 Examples currently in use include individual stepper motors for the symbol-bearing wheels or various combinations of motor and brake assemblies. The physical control of such rotating wheels are well known with respect to slot machine design. Further description of controller 20 is believed to be unnecessary in order to enable one familiar with such equipment to utilize the present  
10 improvements in slot machine features and operation.

One novel aspect of this invention relates to having reordered stop sequencing of the symbols of a selected set. Reordered stop sequencing can be effected by using variable stop sequences, or by remapping a particular symbol set to effect a reordered stop sequence for the symbols. The reordering of the  
15 symbol stop sequences by using variable reel stop sequencing is effected by having different stop sequence assignments which cause the reels 14 or simulated reels (not shown) to stop in different orders depending upon the set of selected symbols which are to be displayed to a player. For example, in typical three-reel slot machines the reels are sequentially indexed to stop the left-hand reel  
20 first, the middle reel next, and the right-hand reel last. One of the novel concepts of this invention is to vary the indexing operation for the multiple reels so as to effect reordering of the stopping sequence. This reordering is done as a variable dependent upon the specific set of symbols which are to be displayed. This symbol-position-variable or reel-variable stop sequencing allows  
25 greater anticipation to be developed because a symbol set combination which includes two or more matching symbols can be indexed to produce a stopping sequence which first stops the similar symbols. This creates greater expectation on the part of the slot machine player that a winning combination of symbols may occur. The reordering may also consider other relationships than just true  
30 matching, such as explained below with regard to symbols which are considered related.

The reel-variable stop sequencing can advantageously involve an index strategy accomplished by programming the reels 14 or other visually movable displays so that the indexed order in which each symbol of a selected set is  
35 displayed to a player becomes a function of which order of presentation results in the most suspense or anticipation. In the preferred embodiment, indexing of



the displayed symbols is sequenced so that the "deciding" symbol is the last to index and therefor be viewable by the player. Matching or otherwise related symbols contained in the set of symbols to be indexed are preferably indexed first, although with machines having more than three reels, the matching might  
5 conceivably be done with internal reels which otherwise might form part of a paying symbol combination. Alternatively, the first symbol indexed may even more preferably be a wild card symbol. Thus the reel which has been assigned this wild card symbol could in one form of the invention be stopped, thus providing by definition two related symbols in the first and second reels being  
10 indexed.

As a further explanation, assume that a group of three identical symbols are required for a specific payout when playing the slot machine. If the randomly selected set of symbols includes two identical symbols and one of a different nature, as soon as a player sees a mismatch or otherwise unwanted  
15 symbol, the players expectation and suspense for winning associated with operation of the slot machine is over until the next pull. This is true even though the symbols within the set of symbols might not yet all be displayed.

A further alternative method for reordering the apparent stopping sequence of the symbol set is by remapping the symbols from one specific order  
20 combination to another slightly different symbol set combination which contains the same symbols but in a different order. The same significance with regard to winning applies in either the original set in its first order, or to the reordered set of the same symbols which are assigned into a second order. Use of this technique can allow the slot machine to be stopped using the same reel  
25 stopping sequence, such as the left-to-right stopping sequence now employed.

It should still further be appreciated that the stop-sequence reordering concept of this invention may have still another alternative form in which the reel stopping sequence reordering and the remapping of symbols to alternative  
30 reels may be combined to effect some further operational flexibility and advantage. For example, it may be possible to have the player decide whether he or she wants to have the reels stop in different reel-varying sequences to enhance the interest in play. Other players may choose to have the more traditional stopping sequence for the reels because they find the variations  
35 distracting or too disordered. Still further it may be possible to have a slot machine programmed to function in one mode part of the time and in the other mode or other modes other parts of the time.

To increase suspense and anticipation on the part of the player, the present improvement requires the software for processor 18 to either: a) rearrange the order of assigning symbols to the individual reels 14 so that the odd symbol or symbols (or the winning symbol or symbols) is or are directed to  
5 the last reel or reels to index or stop, or b) cause the software to rearrange or remap the order in which the reels 14 are indexed or stopped to achieve the same desired result. The resulting change in sequence of play will result in a player becoming more emotionally involved in the game, thus making it more exciting.

10 Reordering the indexing sequence for the individual reels 14 each time the game is played also eliminates expectations of certain results each time that the machine is indexed from one side to the other or in any other pattern. since the order of indexing will be random and cannot be associated with predetermined results.

15 In its basic form, the present method of operating a slot machine first requires that processor 18 must be programmed to randomly select a set of symbols to be assigned to the visually moving displays, exemplified by the three reels 14 shown in Fig. 1. Processor 18 must then determine whether the selected set of symbols includes a subset of related symbols numbering one less  
20 than the number of visually movable displays or reels 14.

"Related" symbols can include any two or more symbols that form part of an identified combination of symbols associated with identified slot machine payouts. This typically includes identical symbols and symbols arranged in a defined sequence. Where a winning symbol set includes all identical symbols,  
25 there will be several such sets of related symbols within the complete set of different combinations forming the available symbol sets. The selected subsets can include any group of the selected symbols within the set, so long as it includes a subset of related symbols that is one less in number than the winning set.

30 Finally, controller 20 must assign the symbols of the selected set to individual visually movable displays or reels 14. In the basic presentation of this improvement, processor 18 is programmed to assign the symbols within a subset of related symbols to all of the visually movable displays or reels 14 but the last reel 14 to be indexed at the completion of an operational sequence of the slot  
35 machine. The method is completed by the processor 18 then assigning the remaining symbol of the selected set to the last visually movable display or

reel 14. As discussed previously, this symbol might be related to the others in the subset to form a winning set of symbols, or it might be unrelated and result in no payout.

Another improvement feature of this invention relates to varying the speed at which the last symbol or symbols are indexed. One important purpose is to add increased anticipation and suspense for the player concerning the outcome of each slot machine operational sequence or play. In a preferred embodiment of slot machine operation, this feature is combined with a novel reordering strategy such as previously described, thereby enhancing the anticipation attached to indexing of the last visually movable display or reel to which the final symbol contained within a set of symbols has been addressed.

In addition to assigning to the initially visible movable displays a subset of related symbols that signify a possibility of a game payout, one can further enhance the suspense of game operation by slowing the final speed of the last visually movable display in comparison to the final speeds of the initially visible displays. For example, the last reel is slowed at a more gradual deceleration rate during the period between indexing of other reels and the time the final reel is stopped and fully indexed. It is preferable to not add additional time to a complete operational sequence or play of a particular slot machine. Thus the total time required to stop the last reel preferably remains the same. However, the indexing process for the final reel is accentuated.

One form of the preferred methods includes accelerated indexing of the initial display symbols, such as the first and second reels. This shortened time between pull of the slot machine lever or other activation (pushing a button), allows additional time for concentration of the player's attention onto the last reel. The quicker stopping or indexing of the initial symbols also allows the deceleration rate of the last reel to be decreased, to give the reel or other similar display an appearance which increases the player's ability to perceive the symbols which are approaching the index position. This significantly builds anticipation in the mind of the player and increases the player's involvement and enjoyment of playing the slot machines. The novel methods preferably include decelerating the angular velocity or apparent angular velocity of the last reel or display at a rate which causes increased deceleration during the period associated with indexing the initial reels or displays, and then having greater amounts of time to view the last reel by itself and at a lower angular velocity and reduced deceleration rate. For example, the first and second reels might be decelerated

at a rate which is calculated to occupy only 10-33 percent of the total play period defined as the time period during which the slot machine has spinning or other display movement or play activity. The remaining 67-90 percent of the play period can be used to more gradually bring the last reel to stop.

5       The deceleration rates of the reels during the initial play period may be approximately 2-100 times greater than the average rate of deceleration for the final reel. The final reel and initial reels can be decelerated at the same rate initially, or at differing rates initially. In general the final reel will be decelerated at a deceleration rate which is equal to or less than the deceleration  
10 rate of the initial reels. The initial reels are those reels stopped in advance of the accentuated emphasis on the final or last reel or reels. The deceleration rates of the initial and final reels can be linear or demonstrate a decreasing rate over the play period or portion of play period during which the reel is being stopped.

15       It is possible to decelerate the final reel at a linearly decreasing angular velocity; however, the appearance and anticipation developed is better when the novel methods involve decreasing the angular velocity of the last reel at a relatively high rate during the first part or portion of the play period while the initial reels are being decelerated, and then changing the deceleration rate of the  
20 last reel to be less than average during the second portion of the play period during which the last reel or reels are being visibly emphasized. Thus the preferred methods include slowing the final reel at a deceleration rate in excess of the average rate of deceleration during the first portion of the play period, coupled with a deceleration rate which is less than the average rate of  
25 deceleration during the second portion of the play period. In more preferred forms of the inventive methods and apparatuses, the deceleration rate during the first portion of the play period will exceed 3 times the minimum deceleration rate of the last reel during the second portion of the play period, more preferably 5 times the minimum deceleration rate, even more preferably 6-10  
30 times the minimum deceleration rate.       It should further be understood that the deceleration rates can be continuously varied from a high rate initially to a lower rate for the final reel during the second portion of the period the reel is decelerated.

It should also be understood that it is alternatively possible in the practice  
35 of the novel methods and apparatuses to selectively or controllably invoke the emphasis on the slowed or accentuated indexing of the last reel or symbol.

dependent upon whether the initial reels present a related symbol combination or not. If the randomly selected set of symbols does not produce a potential winning combination, then there is no subset of related symbols which cause the player to anticipate a win with any symbol which may assume the index position.

5 In these modified operational methods, the slower deceleration rate of the last reel can be brought to a rate which is higher than deceleration rates which apply when the initial reels have a related combination of symbols which would create anticipation by the player. These variations in deceleration rate can be used to decrease the total playing period and increase revenues per hour of  
10 casino time.

Sound also can be added to the concepts presented herein to further emphasize the anticipation element of waiting for the identification of the final symbol within a set. Repetitive sounds can be played at varying speeds corresponding to the speed of the final display or can be played at varying  
15 volumes corresponding to the changes in speed. Additionally, a varying tonal pitches can be used to call attention to this feature. The nature of the sound itself can be modified as the final display is indexed. Various combinations of these sound enhancements can be coordinated with indexing of the display by proper programming of processor 18.

20 Figs. 3-7 broadly illustrate physical forms of a slot machine incorporating another feature of the invention that facilitates viewing of an extension of that portion of a physical reel or disk normally seen by a player through a window 15. In these embodiments, a wider range of view of the oncoming symbols is provided during indexing of the wheels or reels, thereby adding to the  
25 player's ability to perceive oncoming symbols and providing increased interest and excitement for the slot machine player. This increased reel viewing ability provides visible access to preferably greater than 25 percent of the available symbols of at least one of the reels. More preferably, the reel viewing provides visual access to greater than 33% of the symbols on the reel. Even more  
30 preferably, reel viewing provides visual access to greater than 50% of the symbols on the reel.

With respect to Figs. 3 and 5, the more extensive viewing area is provided on each of several reels having visual symbols arranged so as to provide a series of symbol images which approach and potentially align with an  
35 index marker. In the embodiments of Figs. 3-5, the cylindrical reels are

individually indexable to present a set of symbols at selected angular positions about their respective axes for viewing purposes.

In Fig. 3, windows 22 are provided for directly viewing a first portion of the symbols at the selected angular position on each reel. An ancillary display 23 is located immediately above each window 22, the demarcation between window 22 and ancillary display 23 being shown as line 24.

The ancillary display 23 might be any optical system for transmitting a pictorial representation of a portion of the reel periphery. One example of such an ancillary display is shown in Fig. 4. In this drawing the ancillary display comprises a reversing lens 25 and an angled mirror 26 that reflects otherwise unviewable portions of the symbol strip 27 to lens 25 for viewing purposes. The result, as depicted in Fig. 3, is an image of the reel that is substantially extended in the direction of oncoming symbols during indexing of the reels.

By providing a player with an extended view of the reel, the anticipation and ability to gauge the likelihood of a payout upon completion of reel movement is substantially heightened.

It is to be understood that a single window can be used for all three reels, perhaps with appropriate framing to identify the individual reels. Similarly, a single ancillary display can be substituted in place of the individual display elements specified in the drawings.

Fig. 5 also illustrates an extended view of the symbol strips on the individual reels of a modified slot machine. In this instance, the extended view is obtained by an optical system providing visual access to a relatively large angular portion of each reel periphery. As one example, this might be achieved by reflecting light from the reel peripheries to bundles of optical fibers leading to the planes of the individual viewing windows identified at 28. The viewable image of the symbols is preferably structured so that the symbols moving toward the index position are increasing in size.

Figs. 6 and 7 illustrate modified forms of a slot machine in which at least one of the visually movable displays is a radial wheel 30 having symbols arranged about an annular display face 31 transverse to its axis. The indexed symbols on wheel 30 are viewed through a center window 32, flanked by side windows 33. The symbols shown in windows 33 might be optically accessed from reels or other rotatable devices (not shown).

In this form of the invention, a large window 34 is provided on the slot machine. A substantial portion of the symbols arranged about the annular

display base 32 can be viewed as the wheel 30 rotates. This permits the player to view symbols adjacent to the symbol or symbols that can be seen in center window 32, thereby again increasing the anticipation of the player and holding his or her attention as the wheel 30 approaches its indexed position.

5 In Fig. 6, the annular display face 31 of wheel 30 is almost entirely visible. In Fig. 7, almost one-half of the annular display face 31 is visible. It is preferred that at least one-quarter of the annular display face 31 about wheel 30 be viewable through the enlarged window 34 on the slot machine.

Fig. 8 shows an alternative form of the invention in a schematic  
10 presentation. In this view a single cylindrical reel 51 is shown, but it is illustrative of any number of desired reels. Alternative reel or display configurations are also possible. A plurality of optical fibers 52 are arranged with image input ends 53 adjacent to an image source, which in this form is the symbol-bearing outer surface of reel 51. The image input ends 53 form an  
15 image collector which is shaped or otherwise configured to gather an image from the reel. The image can advantageously be a composite image made from numerous image pixels. The optical fibers form an image conveyance which transfers the image or images gathered from the reel, and conveys them to a viewable presentation. This is done at optical fiber display ends 54. The  
20 display ends 54 of the optical fibers are positioned so as to form an image emitter or image emitting array which is either directly visible or passed through one or more lenses or screens 55 in order to focus or otherwise enhance the image viewed by the player. The player sees an image, or more preferably a composite of numerous image pixels, which show the symbols present on the  
25 periphery of the reel or otherwise made available from the image source for viewing by the player's eye 56.

The optical fibers can be of various types. In one form of the invention some or all of the optical fibers can be tapered to allow the desired degree of magnification or demagnification desired. This can be used to reduce the  
30 viewing size of the symbol images to observer 56 dependent upon the proximity of the symbol to an index marker (not shown in Fig. 8).

It is to be understood that the various features described above can be used both individually and in combination, to lend additional excitement and interest to play on a slot machine. In most instances existing slot machines can  
35 be retrofitted to include these enhancements by modifying the viewing windows or optical elements providing visual access to the wheels presenting game symbols

for indexing purposes, or by modifying the software that controls operation of a conventional processor 18.

As an example, one might remap the randomly generated symbols so that the wheel 30 in Figs. 6 or 7 is the last of the visually movable displays to be indexed. In addition, the rotational speed of symbols on wheel 30 can be slowed in relation to the rotational speed of the symbols viewed in windows 33 as these symbols approach their indexed positions. At the same time, the display of symbols in the side windows 33 might be accelerated.

In this manner, the viewer will quickly note the possibility of a payout when related symbols appear in the side windows 33, and his or her attention will be drawn to the slower movement of symbols on the wheel 30 as it approaches its indexed position for viewing of a symbol in the center window 32. This will increase the suspense and excitement incidental to each play of the machine.



**CLAIMS**

1. A slot machine, comprising:

a plurality of reels, each reel having visual symbols arranged in a series about a rotational axis, the reels being individually indexable to present a set of symbols at selected angular positions about their respective axes for viewing purposes;

a window for directly viewing a first portion of the symbols at the selected angular position on one reel; and

an ancillary display adjacent to the window for indirectly viewing a second portion of the symbols on the one reel which is an extension of the first portion and which is otherwise not directly viewable through the window.

2. The slot machine of claim 1, wherein the window provides for directly viewing a first portion of the symbols at the selected angular position on each reel; and

the ancillary display provides for indirectly viewing a second portion of the symbols on each reel which is an extension of its first portion and which is otherwise not directly viewable through the window.

3. The slot machine of claim 1, wherein the window includes a separate window element and a separate ancillary display assembly for each reel.

4. The slot machine of claim 1, wherein the window includes a separate window element and a separate ancillary display assembly for each reel; the ancillary display assembly comprising:

a mirror reflecting the second portion of the symbols on the one reel; and

a reversing lens through which the mirror can be viewed by a player.

5. The slot machine of claim 1, wherein the reels comprise independently rotatable cylinders having visual symbols arranged about their respective circumferential peripheries.

6. A slot machine, comprising:

a plurality of wheels, each wheel having visual symbols arranged in a series about a rotational axis, the wheels being individually indexable to present a set of symbols at selected angular positions about their respective axes for viewing purposes;

one wheel having its symbols arranged about an annular display face transverse to its axis; and

a window through which a portion of the annular symbols arranged about the display face of the one wheel can be viewed as the wheel rotates to allow viewing of symbols adjacent to the selected angular position about the axis of the wheel.

5        7. The slot machine of claim 6, wherein at least one quarter of the display face of the one wheel is viewable through the port.

8. The slot machine of claim 6, wherein the remaining wheels are independently rotatable reels having visual symbols arranged about their circumferential peripheries.

10       9. A slot machine having a plurality of visually movable displays each presenting a series of symbols that can be indexed to display a selected set of symbols at the completion of an operational sequence initiated by a player;  
the slot machine comprising:

a processor for

15       (a) randomly selecting a set of symbols to be assigned to the visually movable displays;

(b) determining whether the selected set of symbols includes a subset of related symbols numbering one less than the number of visually movable displays; and

20       (c) assigning the symbols of the selected set of symbols to the individual visually movable displays; and

a controller for individually indexing the visually movable displays to display the set of symbols to a player in a timed sequence in which the visually movable displays to which the subset of related symbols is assigned are indexed.  
25 prior to indexing a last visually movable display.

10. The slot machine as set out in claim 9, wherein the controller slows the final speed of the last visually movable display to be indexed in comparison to the final speeds of the remaining visually movable displays as they are indexed.

30       11. The slot machine as set out in claim 9, wherein the processor determines whether the related symbols of the subset are identical to one another.

12. A slot machine having a plurality of visually movable displays each presenting a series of symbols that can be indexed to display a selected set of  
35 symbols to a player at the completion of an operational sequence initiated by the player;

the slot machine comprising:

a controller for individually indexing the visually movable displays in a timed sequence; and

a processor for

5 (a) randomly selecting a set of symbols to be assigned to the visually movable displays;

(b) determining whether the selected set of symbols includes a subset of related symbols numbering one less than the number of visually movable displays; and

10 (c) assigning the symbols of the selected set of symbols to the individual visually movable displays.

13. The slot machine as set out in claim 12, wherein the processor assigns the symbols within a subset of related symbols to all of the visually movable displays but the last visually movable display to be indexed at the  
15 completion of an operational sequence and assigns the remaining symbol of the selected set to such last visually movable display.

14. The slot machine as set out in claim 12, wherein the visually movable displays comprise:

a plurality of reels each formed as an independently rotatable cylinder  
20 having visual symbols arranged about its circumferential periphery.

15. The slot machine as set out in claim 12, wherein the visually movable displays to which the subset of related symbols is assigned comprises:

a plurality of reels each formed as an independently rotatable cylinder having visual symbols arranged about its circumferential periphery; and

25 the last visually movable display comprises;

a wheel having its symbols arranged about an annular display face transverse to its axis.

16. The slot machine as set out in claim 12, wherein the controller slows the final speed of the last visually movable display to be indexed in  
30 comparison to the final speeds of the remaining visually movable displays as they are indexed.

17. The slot machine as set out in claim 12, wherein the processor determines whether the related symbols of the subset are identical to one another.

35 18. The slot machine as set out in claim 12, wherein the visually movable displays comprise:

a plurality of reels, each reel having symbols arranged about a cylindrical periphery centered about a rotational axis, the reels being individually indexable to present a set of symbols at selected angular positions about their respective axes for viewing purposes;

5 a window for directly viewing a first portion of the symbols at the selected angular position on one reel; and

an ancillary display adjacent to the window for indirectly viewing a second portion of the symbols on the one reel which is an extension of the first portion and which is otherwise not directly viewable through the window.

10 19. The slot machine as set out in claim 12, wherein the visually movable displays comprise:

a plurality of reels, each reel having symbols arranged on a cylindrical periphery centered about a rotational axis, the reels being individually indexable to present a set of symbols at selected angular positions about their respective  
15 axes for viewing purposes;

a plurality of windows for directly viewing first portions of the symbols at the selected angular positions on each reel;

a plurality of ancillary displays adjacent to the respective windows for indirectly viewing second portions of the symbols on each reel which are  
20 extensions of their first portions and which are otherwise not directly viewable through the windows.

20. The slot machine as set out in claim 12, wherein the visually movable displays comprise:

a plurality of wheels, each wheel having symbols arranged about a  
25 rotational axis, the wheels being individually indexable to present a set of symbols at selected angular positions about their respective axes for viewing purposes;

one wheel having its symbols arranged about an annular display face transverse to its axis; and

30 a window through which a portion of the annular symbols arranged about the display face of the one wheel can be viewed as the wheel rotates to allow viewing of symbols adjacent to the selected angular position about the axis of the wheel.

21. The slot machine as set out in claim 12, wherein the visually  
35 movable displays comprise:

a plurality of wheels, each wheel having symbols arranged about a rotational axis, the wheels being individually indexable about their axes to present a set of symbols at selected angular positions about their respective axes for viewing purposes;

5       one wheel having its symbols arranged about an annular display face transverse to its axis; and

a window through which at least one quarter of the display face of the one wheel can be viewed as the wheel rotates to allow viewing of symbols adjacent to the selected angular position about the axis of the wheel.

10       22. A slot machine having a plurality of wheels each having a series of symbols arranged about a rotational axis, the wheels being individually indexable about their respective axes to display a selected set of symbols at the completion of an operational sequence initiated by a player;

the slot machine comprising:

15       a processor for

(a) randomly selecting a set of symbols to be assigned to the wheels;

20       (b) determining whether the selected set of symbols includes a subset of related symbols numbering one less than the number of visually movable displays; and

(c) assigning the symbols of the selected set of symbols to the individual visually movable displays; and

a controller for individually indexing the wheels to display the set of symbols to a player in a timed sequence such that the wheels to which the  
25       subset of related symbols is assigned are indexed prior to indexing of a last wheel.

23. The slot machine as set out in claim 22, wherein the controller also slows the final rotational speed of the last wheel to be indexed in comparison to the final rotational speeds of the remaining wheels as they are  
30       indexed.

24. The slot machine as set out in claim 22, wherein the processor determines whether the related symbols of the subset are identical to one another.

25. A slot machine having a plurality of wheels each having a series  
35       of symbols arranged about a rotational axis, the wheels being individually

indexable about their respective axes to display a selected set of symbols at the completion of an operational sequence initiated by a player;

the slot machine comprising:

a controller for individually indexing the wheels in a timed sequence; and  
5 a processor for

(a) randomly selecting a set of symbols to be assigned to the wheels;

(b) determining whether the selected set of symbols includes a subset of related symbols numbering one less than the number of wheels;  
10 and

(c) assigning the symbols of the selected set of symbols to the individual wheels.

26. The slot machine as set out in claim 25, wherein the processor assigns the symbols within a subset of related symbols to all of the wheels but  
15 the last wheel to be indexed and assigns the remaining symbol of the selected set to such last wheel.

27. The slot machine as set out in claim 25, wherein the controller slows the final rotational speed of the last wheel to be indexed in comparison to the final rotational speeds of the remaining wheels as they are indexed.

20 28. The slot machine as set out in claim 25, wherein the processor determines whether the related symbols of the subset are identical to one another.

29. A method of operating a slot machine having a plurality of visually movable displays each presenting a series of symbols that can be indexed to  
25 display a selected set of symbols at the completion of an operational sequence initiated by a player;

the method comprising:

randomly selecting a set of symbols to be assigned to the visually movable displays;

30 determining whether the selected set of symbols includes a subset of related symbols numbering one less than the number of visually movable displays; and

assigning the symbols of the selected set of symbols to the individual visually movable displays; and

35 individually indexing the visually movable displays to display the set of symbols to a player in a timed sequence in which the visually movable displays

to which the subset of related symbols is assigned are indexed prior to indexing a last visually movable display.

30. The method of operating a slot machine as set out in claim 29, comprising the following additional step:

5 slowing the final speed of the last visually movable display to be indexed in comparison to the final speeds of the remaining visually movable displays as they are indexed.

31. The method of operating a slot machine as set out in claim 29, comprising the following additional step:

10 determining whether the related symbols of the subset are identical to one another.

32. A method of operating a slot machine having a plurality of rotatable wheels each having visual symbols arranged in a series about them for display after the wheels have been individually indexed in a timed sequence at  
15 the completion of an operational sequence initiated by a player;

the method comprising the following steps:

initiating an operational sequence by simultaneously rotating the wheels;  
randomly selecting a set of symbols to be displayed by the wheels;  
determining whether the selected set of symbols includes a subset including

20 related symbols numbering one less than the number of wheels;

(a) if the selected set of symbols does not contain the subset,  
randomly assigning the symbols to the individual wheels;

(b) if the selected symbol set does contain the subset, assigning the  
symbols within it to all but the last wheel to be stopped in the preset  
25 operational sequence and assigning the remaining symbol in the selected  
set of visual symbols to such last wheel; and

progressively indexing the individual wheels in the operational sequence to  
cause the set of symbols to be displayed by the wheels.

33. The method of operating a slot machine as set out in claim 32,  
30 further comprising the step of slowing the final rotational speed of the last  
wheel as it is indexed in comparison to the final rotational speeds of the  
remaining wheels as they are indexed.

34. The method of operating a slot machine as set out in claim 32,  
wherein the determining step further ascertains whether the related symbols of  
35 the subset are identical to one another.

35. The method of operating a slot machine as set out in claim 32, further comprising the following step:

arranging the symbols about circumferential peripheries of individually rotatable reels that are rotatable about a common axis.

5 36. The method of operating a slot machine as set out in claim 32, further comprising the following step:

arranging the symbols about a radial surface of a wheel that is rotatable about an axis perpendicular to the radial surface.

37. A method of operating a slot machine having a plurality of visually  
10 movable displays each including visual symbols arranged in a series for display after the visually movable displays have been individually stopped in a timed sequence at the completion of an operational sequence initiated by a player;

the method comprising the following steps:

randomly selecting a set of symbols for assignment to the visually movable  
15 displays upon initiation of an operational sequence by a player;

determining whether the selected set of symbols includes a subset including related symbols numbering one less than the number of visually movable displays;

(a) if the selected set of symbols does not contain the subset,  
randomly assigning the symbols to the individual visually movable displays;

20 (b) if the selected symbol set does contain the subset, assigning the symbols within it to all but the last visually movable display to be stopped in the operational sequence and assigning the remaining symbol in the selected set of visual symbols to such last visually movable display; and progressively stopping motion of the individual visually movable displays in

25 the preset operational sequence such that related symbols within the set are visible to a player prior to stopping of the last visually movable display.

38. The method of operating a slot machine as set out in claim 37, further comprising the following step:

slowing the final display speed of the symbols of the last visually movable  
30 display relative to the display speeds of the remaining visually movable displays.

39. The method of operating a slot machine as set out in claim 37, wherein the determining step further ascertains whether the related symbols of the subset are identical to one another.

40. A slot machine, comprising:



a plurality of reels, each reel having visual symbols arranged upon the reels; the reels being capable of being individually indexed to present varying sets of selected symbols which determine play of the slot machine;

at least one display for viewing at least a portion of the symbols  
5 presented on the reels;

at least one image collector for collecting images of symbols from at least one of the reels; said image collector being capable of collecting images of at least 25 percent of the available images associated with said symbols;

an image conveyor for conveying the image from the at least one image  
10 collector to provide display of an image upon the at least one display for viewing by a player.

41. The slot machine of claim 40, wherein the at least one image conveyor includes an array of optical fibers.

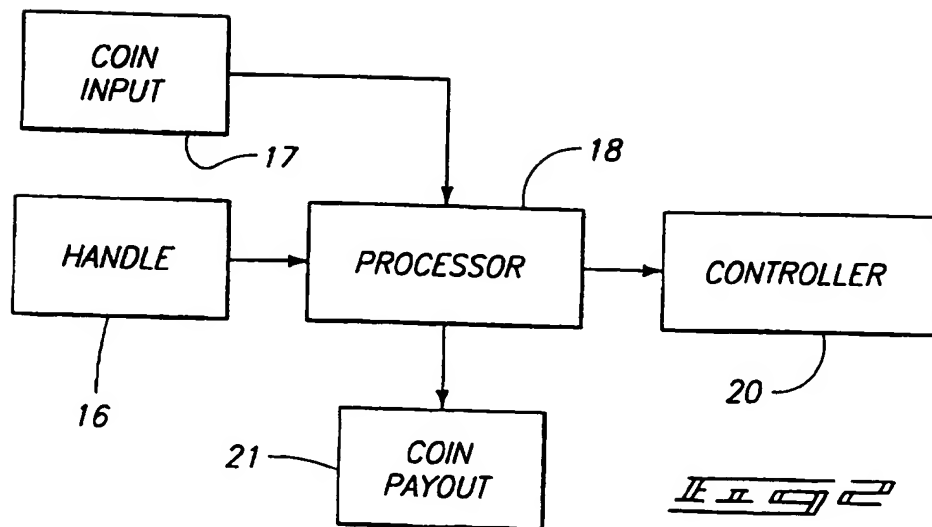
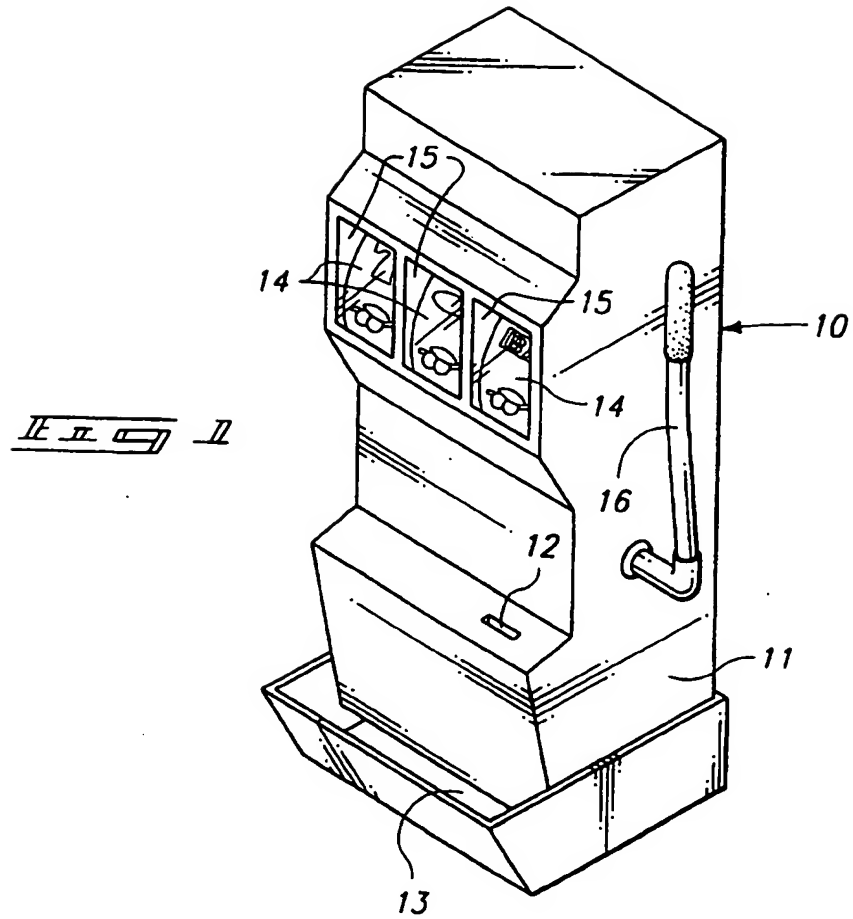
42. The slot machine of claim 40, wherein the at least one display  
15 includes:

a window which provides for directly viewing a first portion of the symbols on each reel; and

an ancillary display which provides for indirectly viewing a second portion of the symbols on the at least one of the reels.

20 43. The slot machine of claim 40, wherein the reels comprise independently rotatable cylinders having visual symbols arranged about their respective circumferential peripheries.

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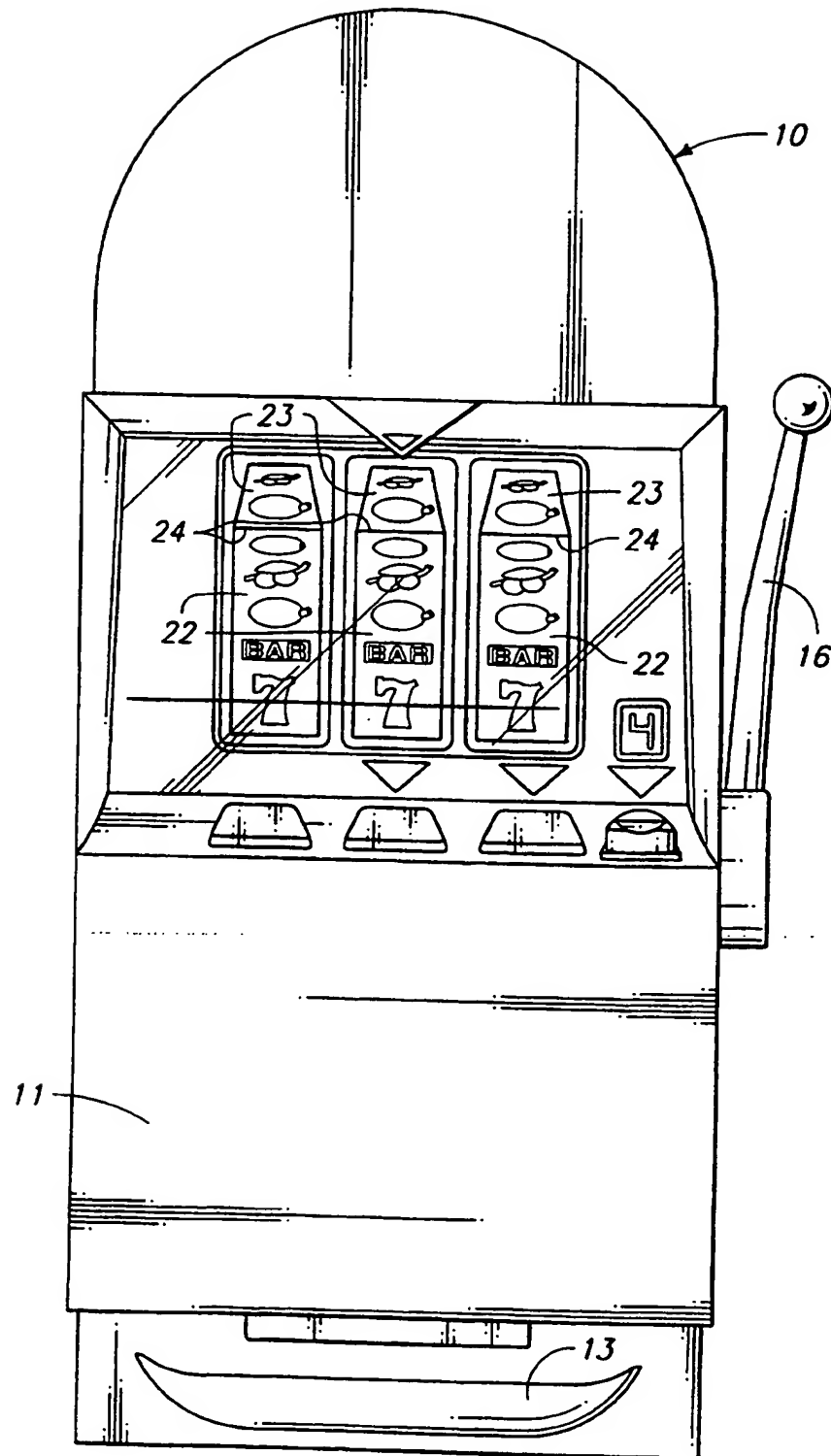


FIG. 2

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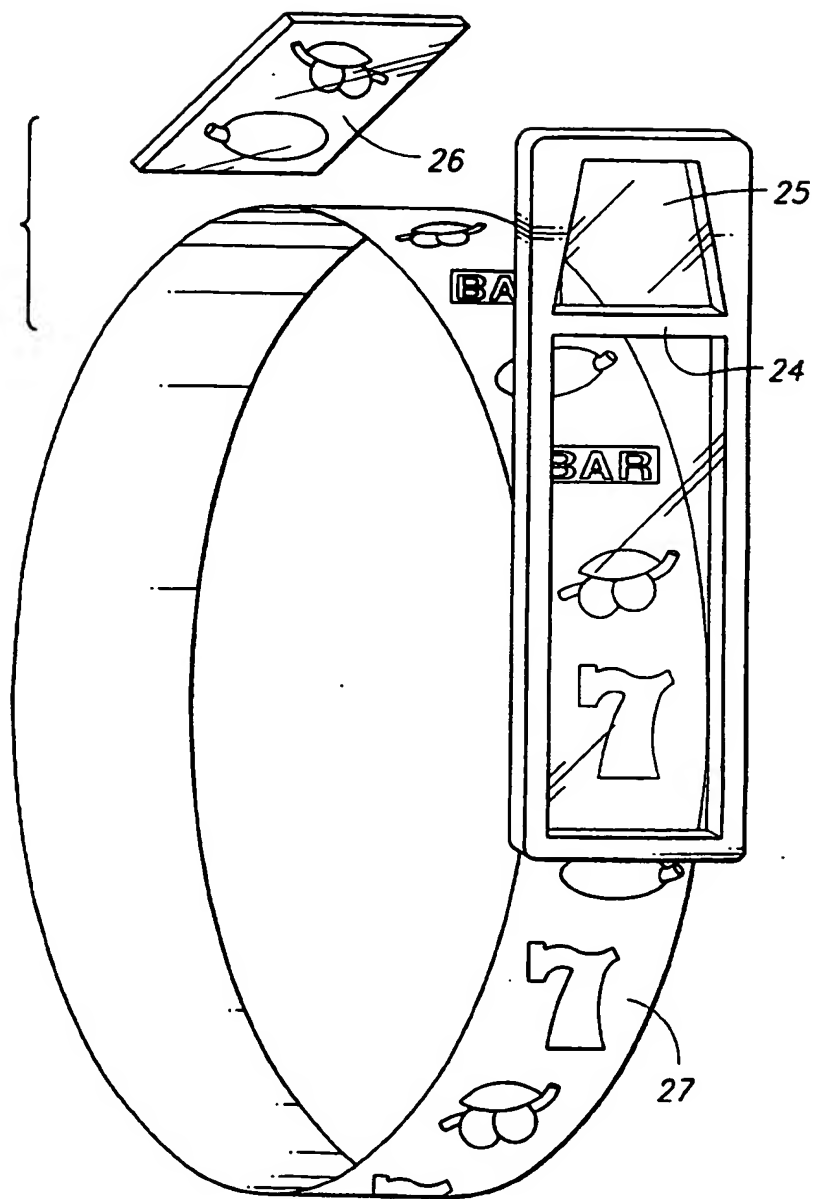


FIG. 4

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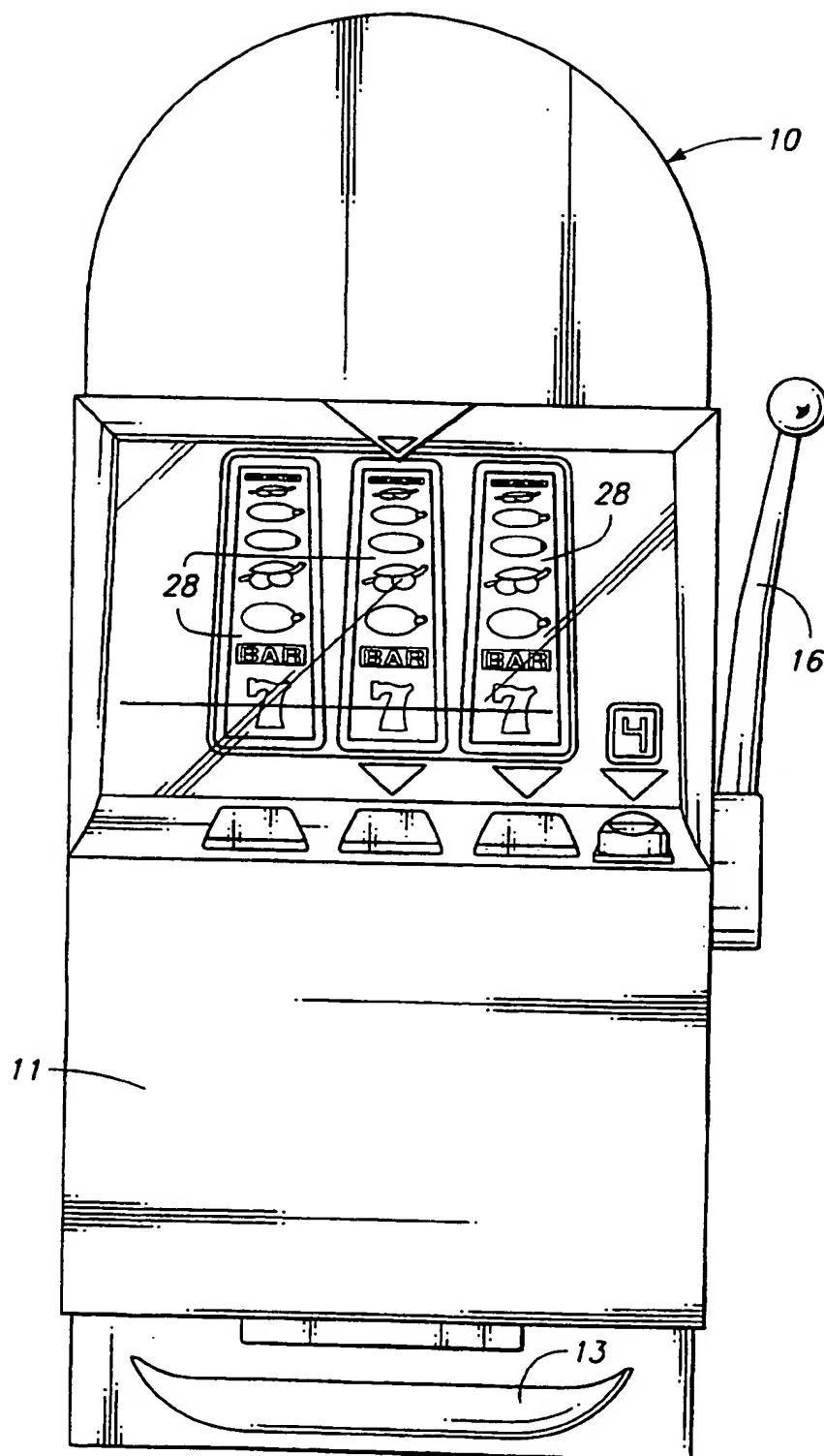
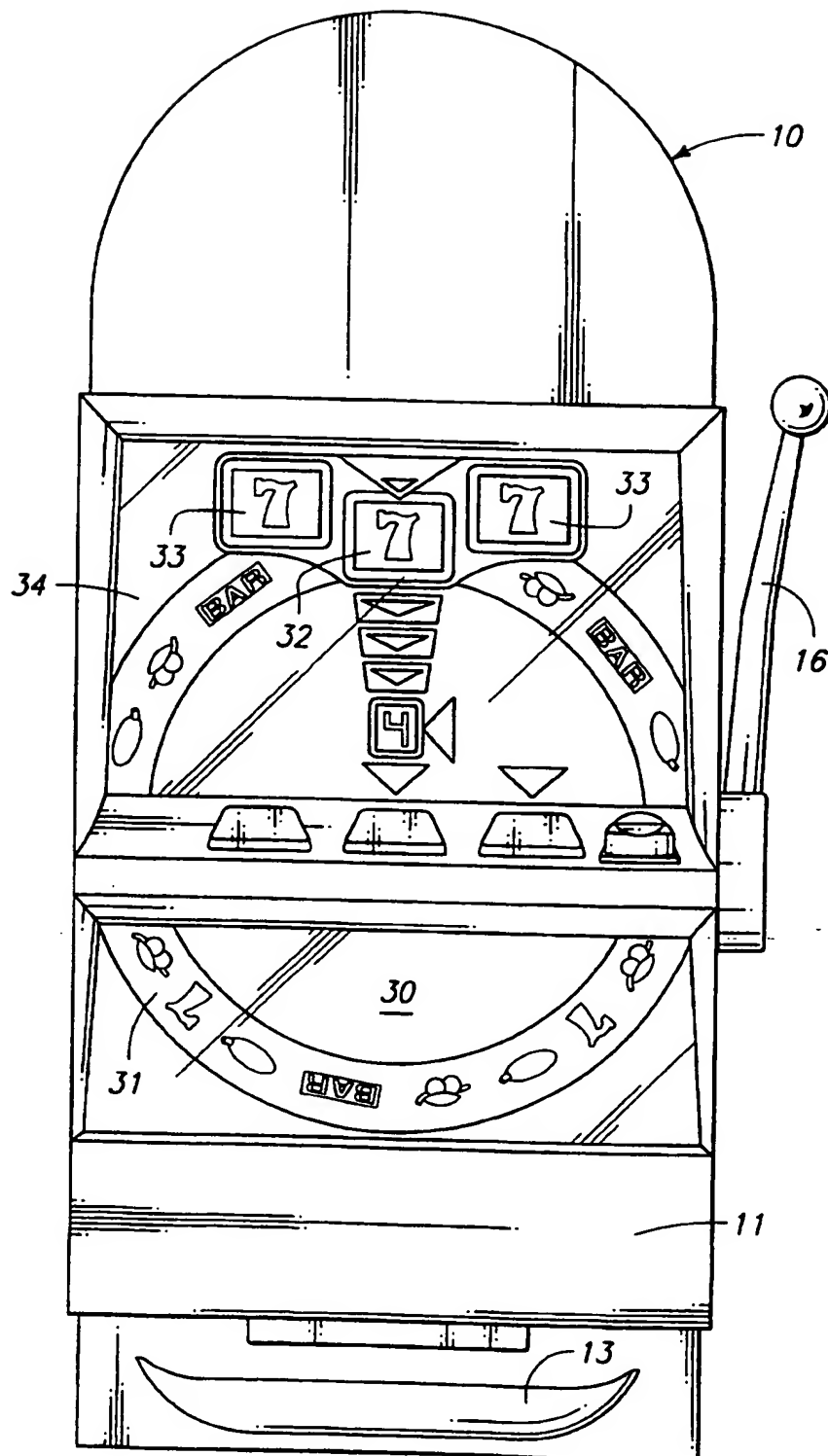


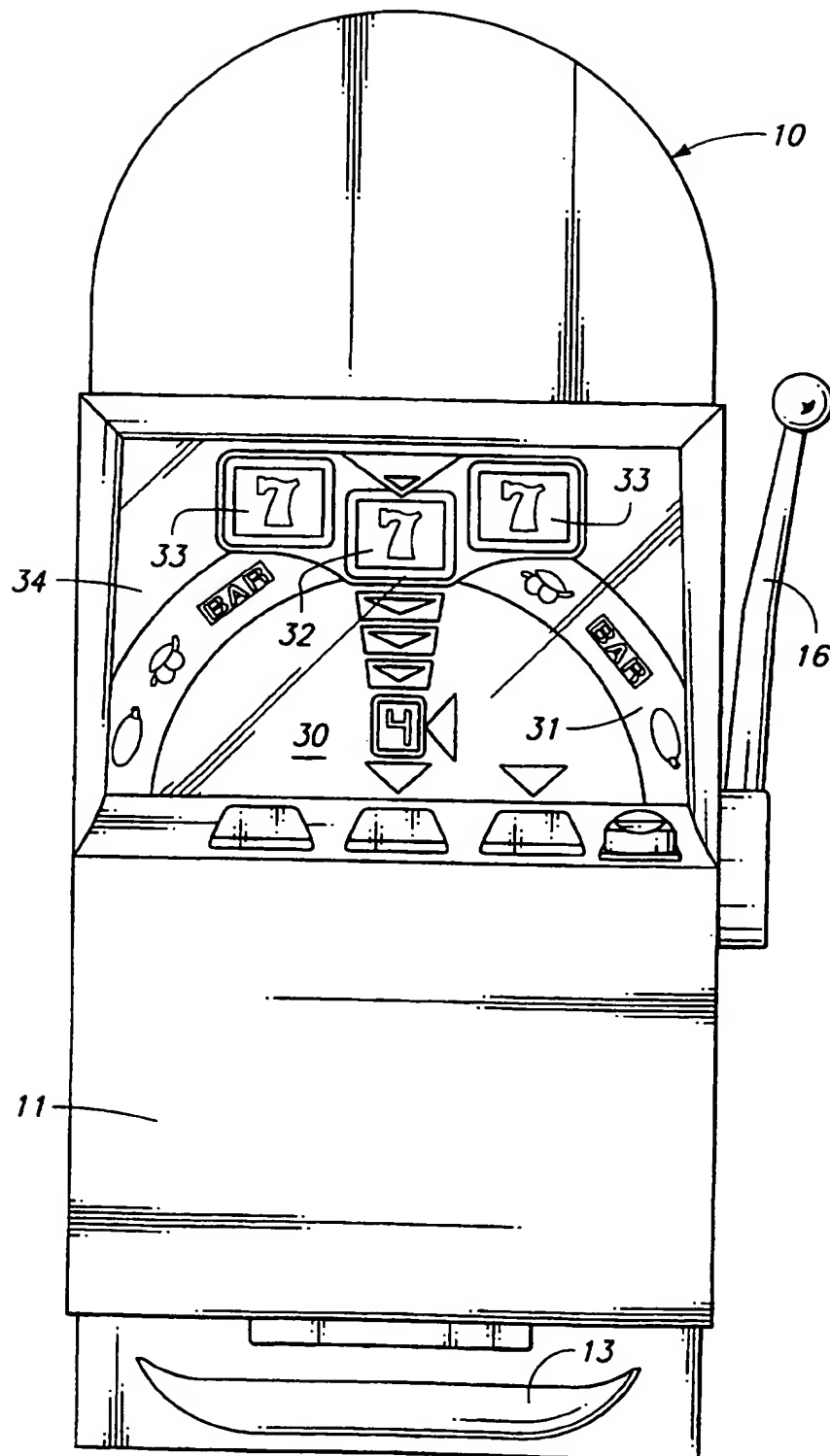
Fig. 5

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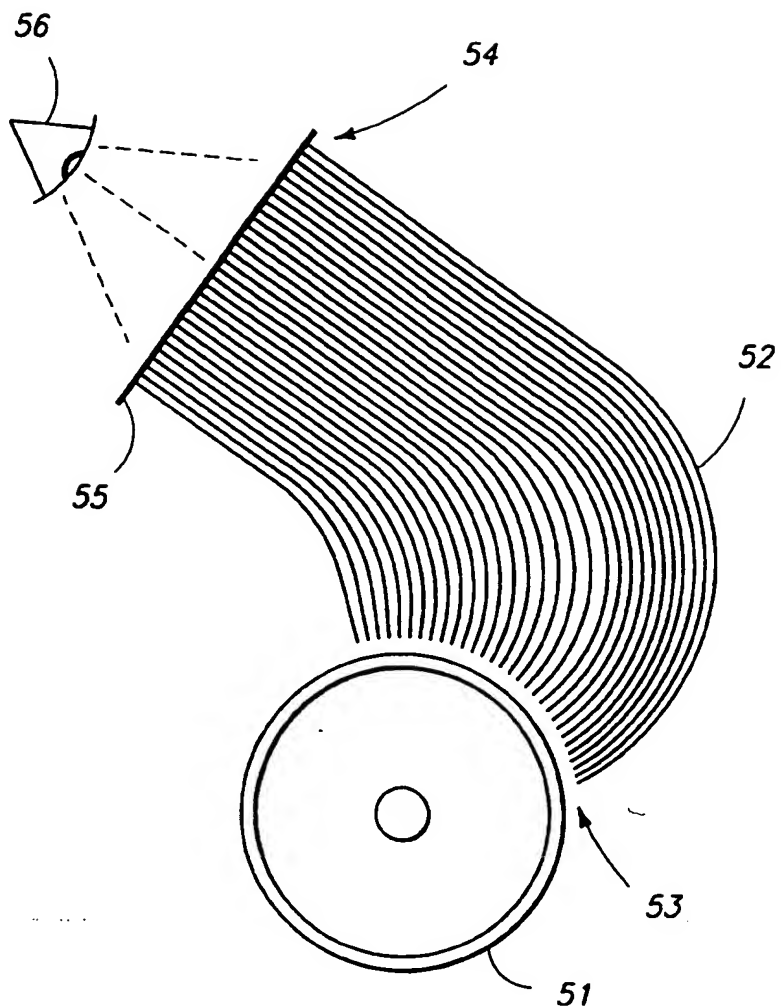
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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US96/02157

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A63F 9/00, 9/22

US CL :463/20, 21, 34

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 463/20, 21, 34

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
463/1, 16, 22, 31

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----- Y ----- A	US, A, 5,429,507 (KAPLAN) 04 July 1995, see figure 1.	6, 8 ----- 20 ----- 1-5, 7, 18-19, 21, 40-43

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be part of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

30 MAY 1996

Date of mailing of the international search report

01 JUL 1996

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US96/02157

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----- Y ----- A	US, A, 5,074,559 (OKADA) 24 December 1991, see entire document.	9, 11, 12-15, 17, 22, 25-26, 28-29, 31-32, 34-37, 39 ----- 20 ----- 10, 16, 18-19, 21, 23, 27, 30, 33, 38
A	US, A, 5,018,737 (OKADA) 28 May 1991, see entire document.	10, 16, 23, 27, 30, 33, 38